Chapter 1

Executive Summary—Assessment of Undiscovered Oil and Gas Resources of the Uinta-Piceance Province of Utah and Colorado, 2002

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By USGS Uinta-Piceance Assessment Team

Chapter 1 *of*
Petroleum Systems and Geologic Assessment of Oil and Gas in the Uinta-Piceance Province, Utah and Colorado
By USGS Uinta-Piceance Assessment Team

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Introduction

The U.S. Geological Survey (USGS) recently completed an assessment of the undiscovered oil and gas potential of the Uinta-Piceance Province of northwestern Colorado and northeastern Utah (fig. 1). The assessment of the Uinta-Piceance Province is based on geologic principles and uses the total petroleum system concept. The geologic elements of a total petroleum system include hydrocarbon source rocks (source rock maturation, hydrocarbon generation and migration), reservoir rocks (sequence stratigraphy, petrophysical properties), and hydrocarbon traps (trap formation and timing). Using this geologic framework, the USGS defined five total petroleum systems and 20 assessment units within these total petroleum systems, and quantitatively estimated the undiscovered oil and gas resources within each assessment unit.

Resources Assessed

For each province in the United States that is to be assessed, the USGS assesses conventional and continuous oil and gas resources (fig. 2). Conventional oil and gas accumulations are defined as having discrete geographic entities with well-delineated hydrocarbon-water contacts. Conventional fields typically have relatively high matrix permeabilities, obvious seals and traps, and high recovery factors. Continuous accumulations (also called

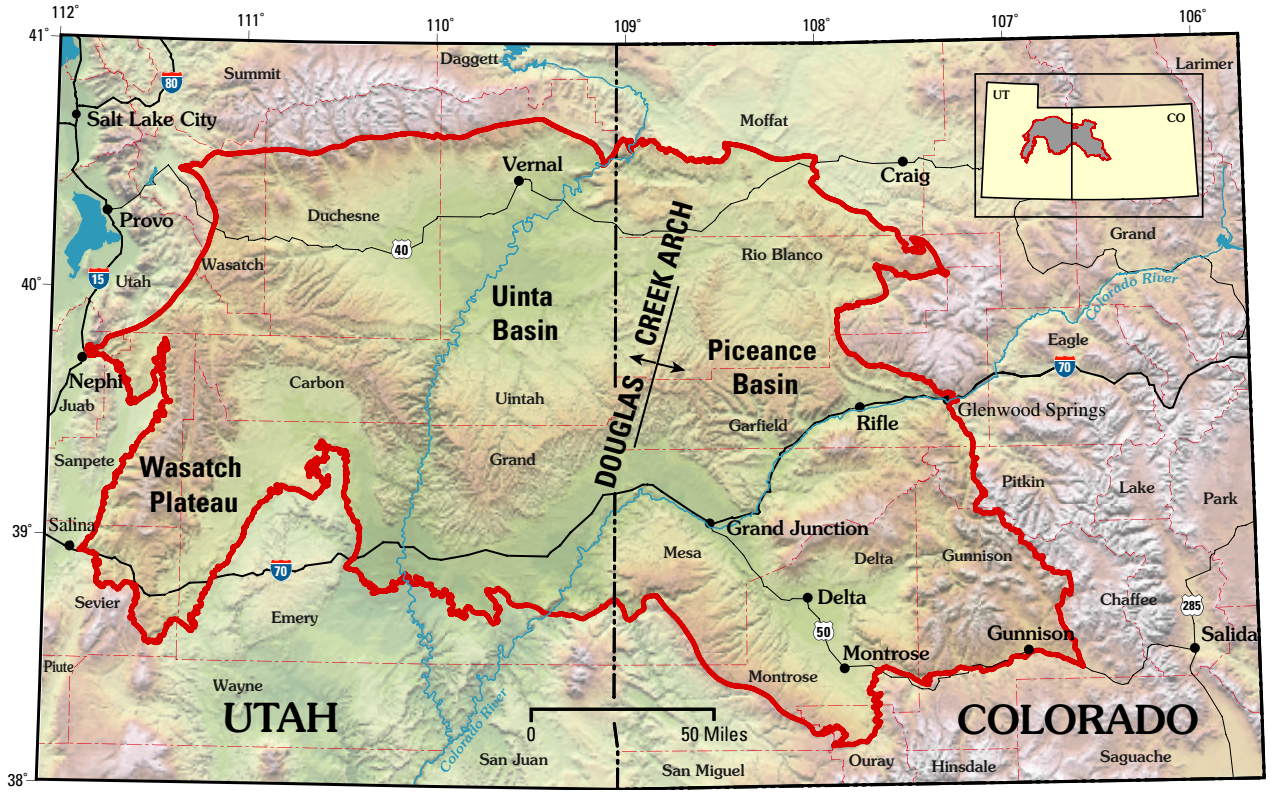

Figure 1. Uinta-Piceance Province in northeastern Utah and northwestern Colorado. Douglas Creek arch separates Piceance Basin from Uinta Basin. Wasatch Plateau is included in this province.

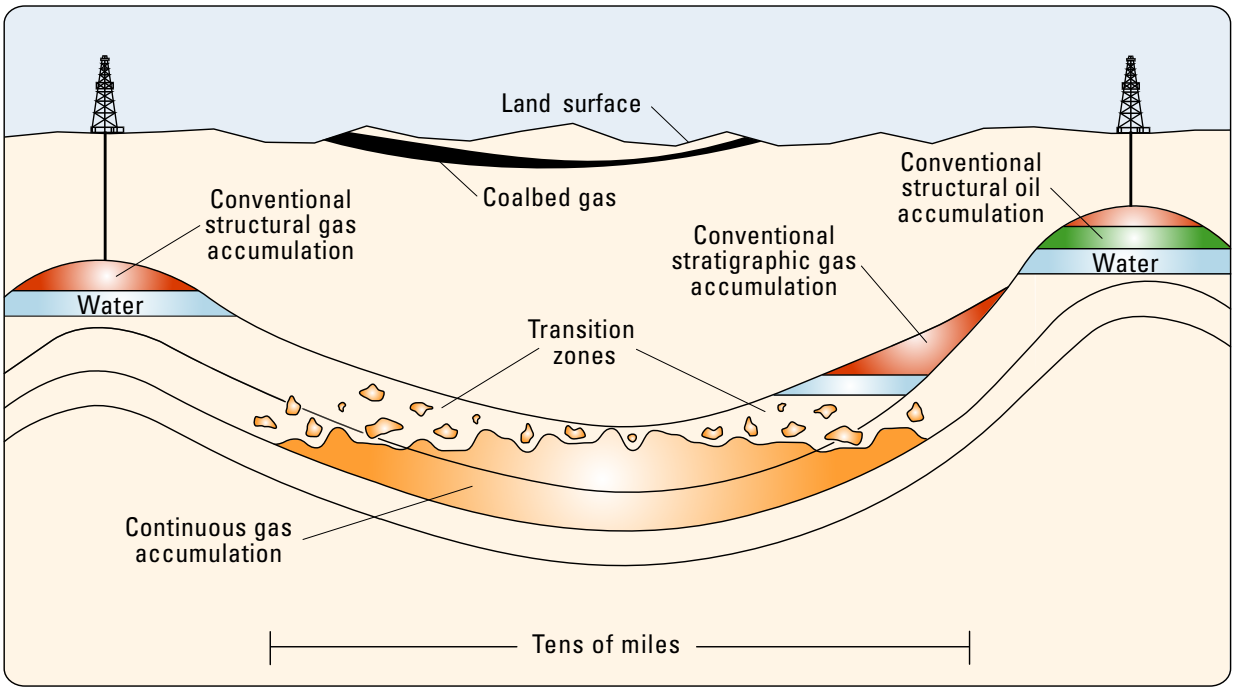

Figure 2. Schematic diagram of the types of oil and gas resources assessed in provinces of the United States.

unconventional, tight sandstones, or basin-centered accumulations) are regional in extent; have diffuse boundaries; commonly have low matrix permeabilities; do not have obvious seals and traps, or hydrocarbon-water contacts; are abnormally pressured; are in close proximity to source rocks; and have very low recovery factors (Schenk and Pollastro, 2002). For this study, coalbed gas is considered to be a type of continuous accumulation (Schenk and Pollastro, 2002). Continuous accumulations commonly have transition zones that grade into more conventional accumulations.

Resource Summary

The USGS assessed undiscovered conventional and continuous oil and gas, including coalbed gas, in 20 assessment units in five total petroleum systems (table 1). The USGS estimated a mean of about 21 trillion cubic feet of gas (TCFG), a mean of about 59 million barrels of oil (MMBO), and a mean of about 43 million barrels of natural gas liquids (MMBNGL). Nearly all of the undiscovered gas resource is estimated to be in continuous reservoirs rather than in conventional reservoirs. Of the 21 TCFG, 13 TCFG is estimated to be in the Mesaverde Total Petroleum System, and 7 TCFG is in the Mancos/Mowry Total Petroleum System. The Ferron/Wasatch Plateau Total Petroleum System and Mesaverde Total Petroleum System together are estimated to contain 2.3 TCF of coalbed gas. The Phosphoria and Green River Total Petroleum Systems contain the balance of the undiscovered gas resource. Of the total undiscovered oil, about 65 percent is continuous oil in the Green River Total Petroleum System in the deep Uinta Basin; the remainder is oil in conventional accumulations in the Green River and Phosphoria Total Petroleum Systems.

Uinta-Piceance Province Assessment Team

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Schenk, C.J., and Pollastro, R.M., 2002, Natural gas production in the United States: U.S. Geological Survey Fact Sheet FS-113-01, January 2002. [Also available at URL http://geology.cr.usgs.gov/pub/fact-sheets/fs-0113-01/]

Table 1. Uinta-Piceance Province assessment results.

[MMBO, million barrels of oil; BCFG, billion cubic feet of gas; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas fields, all liquids are included under the NGL (natural gas liquids) category. Undiscovered gas resources are the sum of non-associated and associated gas. F95 represents a 95 percent chance of at least the amount tabulated. Other fractiles are defined similarly. Fractiles are additive under the assumption of perfect positive correlation. Gray shade indicates not applicable. CBG is coalbed gas.]

	Total Petroleum Systems (TPS) and Assessment Units (AU)	Field Type	Total Undiscovered Resources											
			Oil (MMBO)				Gas (BCFG)				NGL (MMBNGL)			
			F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Conventional Oil and Gas Resources	**Phosphoria TPS**													
	Hanging Wall AU	*Oil*	1.75	4.13	8.37	4.47	0.47	1.21	2.67	1.34	0.03	0.07	0.17	0.08
		Gas					10.48	24.78	50.27	26.81	0.30	0.78	1.70	0.86
	Paleozoic/Mesozoic AU	*Oil*	2.66	5.82	11.55	6.29	0.71	1.70	3.69	1.89	0.04	0.10	0.23	0.11
		Gas					15.82	43.74	94.30	48.04	0.47	1.36	3.21	1.54
	Ferron/Wasatch Plateau TPS													
	Ferron Sandstone Gas AU	*Gas*					10.73	35.91	81.23	39.75	0.03	0.07	0.19	0.08
	Mesaverde TPS													
	Mesaverde Sandstone Gas AU	*Gas*					17.91	58.95	140.12	66.41	0.13	0.46	1.18	0.53
	Green River TPS													
	Uinta Green River Oil and Gas AU	*Oil*	2.74	8.52	20.52	9.63	7.59	24.83	63.73	28.88	0.42	1.45	3.98	1.73
	Total Conventional Resources		**7.15**	**18.47**	**40.44**	**20.39**	**63.71**	**191.12**	**436.01**	**213.12**	**1.42**	**4.29**	**10.66**	**4.93**
Continuous Oil and Gas Resources	**Mancos/Mowry TPS**													
	Piceance Basin AU	*Gas*					649.30	1,463.09	3,296.86	1,652.90	0.60	1.43	3.45	1.65
	Uinta Basin AU	*Gas*					1,781.69	2,965.07	4,934.43	3,110.69	3.16	5.81	10.67	6.22
	Uinta-Piceance Transitional and Migrated Gas AU	*Gas*					1,429.61	1,742.59	2,124.11	1,755.26	0.74	1.98	5.31	2.37
	Ferron/Wasatch Plateau TPS													
	Deep (>6000 feet) Coal and Sandstone AU	*Gas*					0.00	52.04	136.43	59.10	0.00	0.00	0.00	0.00
	Northern Coal Fairway/Drunkards Wash AU	*CBG*					451.14	722.18	1,156.05	752.33	0.00	0.00	0.00	0.00
	Central Coal Fairway/ Buzzards Bench AU	*CBG*					311.61	512.69	843.54	536.73	0.00	0.00	0.00	0.00
	Southern Coal Fairway AU	*CBG*					78.16	145.81	255.49	152.59	0.00	0.00	0.00	0.00
	Southern Coal Outcrop AU	*CBG*					0.00	9.95	30.71	10.56	0.00	0.00	0.00	0.00
	Mesaverde TPS													
	Uinta Basin Continuous AU	*Gas*					4,134.18	7,018.47	11,915.02	7,391.36	5.52	10.31	19.27	11.09
	Uinta Basin Transitional AU	*Gas*					889.42	1,431.73	2,304.72	1,492.97	1.18	2.10	3.76	2.24
	Piceance Basin Continuous AU	*Gas*					1,902.23	2,956.15	4,594.01	3,064.27	5.00	8.69	15.09	9.19
	Piceance Basin Transitional AU	*Gas*					161.74	284.47	500.33	301.73	0.29	0.56	1.07	0.60
	Uinta Basin Blackhawk Coalbed Gas AU	*CBG*					181.97	433.84	1,034.28	498.78	0.00	0.00	0.00	0.00
	Mesaverde Group Coalbed Gas AU	*CBG*					138.72	322.45	749.54	367.77	0.00	0.00	0.00	0.00
	Green River TPS													
	Deep Uinta Overpressured Continuous Oil AU	*Oil*	24.83	37.57	56.84	38.78	35.72	60.74	103.29	63.99	2.23	4.17	7.79	4.48
	Total Continuous Resources		**24.83**	**37.57**	**56.84**	**38.78**	**12,145.49**	**20,121.27**	**33,978.81**	**21,211.03**	**18.72**	**35.05**	**66.41**	**37.84**
	Total Undiscovered Oil and Gas Resources		**31.99**	**56.04**	**97.28**	**59.17**	**12,209.20**	**20,312.39**	**34,414.82**	**21,424.15**	**20.14**	**39.34**	**77.07**	**42.77**

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